I CLAIM:

1. An electro-mechanical machine, comprising:

a field producing assembly having a cup-shaped air gap which is circumferentially disposed about an axis of rotation, the field producing assembly producing a circumferential distribution of magnetic flux in the cup-shaped air gap having *N* periodic extremes of flux density about the axis; and

a cup-shaped electrical assembly disposed in the air gap and including a circular array of *C* non-overlapping coils on one of an inner and outer face of the electrical assembly;

the field producing and electrical assemblies being mounted so as to be relatively rotatable about said axis of rotation.

2. The machine of claim 1 comprising a circular array of *C* non-overlapping coils on each of an inner and outer face of the electrical assembly with the coils on one face being angularly offset from the coils on the other face.

3. The machine of claim 1 wherein each coil extends over two angularly disposed surfaces of said electrical assembly.

4. The machine of claim 3 wherein each coil is generally L-shaped in profile.

5. The machine of claim 3 wherein said coils are constructed so that each coil is wound to conduct current in an opposite rotational sense relative to a next adjacent coil.

6. The machine of claim 1 comprising a first subset of *C* coils circularly disposed on one of two angularly disposed surfaces of said electrical assembly and a second subset of *C* coils cylindrically disposed on the other of

said two surfaces, each coil in the first subset being axially aligned with a corresponding coil in the second subset.

7. The machine of claim 6 wherein subsets of coils are constructed so that each coil in a subset is wound so as to conduct current in an opposite rotational sense relative to a next adjacent coil in the same subset and corresponding coils in different subsets are wound so as to conduct current in the same rotational sense.

8. The machine of claim 1 wherein said field producing assembly comprises *N* circumferentially spaced magnet subassemblies disposed on one side of said air gap, each magnet subassembly being generally L-shaped in a cross-section taken through said axis and being magnetically polarized opposite to a next adjacent magnet subassembly in a direction normal to the air gap.

9. The machine of claim 8 wherein said field producing assembly comprises *N* circumferentially spaced magnet subassemblies disposed on either side of said air gap, each magnet subassembly being generally L-shaped in a cross-section taken through said axis and being magnetically polarized opposite to a next adjacent magnet assembly in a direction normal to the air gap, the magnet subassemblies on opposite sides of the air gap being circumferentially aligned, and each magnet subassembly being magnetically polarized opposite to an opposed magnet subassembly in a direction normal to the air gap.

10. The machine of claim 8 comprising a circular array of *C* non-overlapping coils on each of an inner and outer face of the electrical assembly with the coils on one face being angularly offset from the coils on the other face.

11. The machine of claim 8 wherein each coil extends over two angularly disposed surfaces of said electrical assembly.

12. The machine of claim 11 wherein each coil is generally L-shaped in profile.

13. The machine of claim 11 wherein said coils are constructed so that each coil is wound to conduct current in an opposite rotational sense relative to a next adjacent coil.

14. The machine of claim 8 comprising a first subset of *C* coils circularly disposed on one of two angularly disposed surfaces of said electrical assembly and a second subset of *C* coils cylindrically disposed on the other of said two surfaces, each coil in the first subset being axially aligned with a corresponding coil in the second subset.

15. The machine of claim 14 wherein subsets of coils are constructed so that each coil in a subset is wound so as to conduct current in an opposite rotational sense relative to a next adjacent coil in the same subset and corresponding coils in different subsets are wound so as to conduct current in the same rotational sense.

16. The machine of claim 1 wherein said air gap includes a generally disk shaped region to which said axis is generally perpendicular and a region which is generally cylindrical about said axis.

17. The machine of claim 1 wherein said electrical assembly includes a generally disk-shaped portion to which said axis is generally perpendicular and a portion which is generally cylindrical about said axis.

18. The machine of claim 2 wherein each roll extends over two angularly disposed surfaces of said electrical assembly.

19. The machine of claim 2 comprising a first subset of *C* coils circularly disposed on one of two angularly disposed surfaces of said electrical assembly and a second subset of *C* coils cylindrically disposed on the other of said two surfaces, each coil in the first subset being axially aligned with a corresponding coil in the second subset.

20. The machine of claim 10 wherein each coil extends over two angularly disposed surfaces of each electrical assembly.

21. The machine of claim 10 comprising a first subset of *C* coils circularly disposed on one of two angularly disposed surfaces of said electrical assembly and a second subset of *C* coils cylindrically disposed on the other of said two surfaces, each coil in the first subset being axially aligned with a corresponding coil in the second subset.